Three-dimensional (3D) immersive virtual worlds have been touted as being capable of facilitating highly interactive, engaging, multimodal learning experiences; as a result, they have enjoyed considerable interest and uptake in education over the past several years. Educators and institutions worldwide have invested heavily in virtual worlds, with some making use of commercially hosted platforms like Second Life and ActiveWorlds, and others extending and adapting open-source products such as OpenSimulator (OpenSim), Open Wonderland, and Open Cobalt to create worlds hosted on internal servers and networks. Still others have built their own bespoke platforms and systems using a variety of programming languages and game engines to accommodate specific needs and goals.

Many of these efforts have been fuelled and driven by beliefs that virtual worlds, with their powerful affordances and rich, immersive properties can be used to achieve higher levels of student engagement and make enhanced educational outcomes more attainable. In the field of online and distance education in particular, there has been much optimism about the promise of virtual worlds to solve traditional problems such as learner isolation, bridging the gap between on- and off-campus cohorts by engendering collaboration and participation, and enabling a greater sense of immediacy, co-presence, and feeling of belonging to a community. Yet much of what has been published in the area has tended to be descriptive, centring almost exclusively around students’ and teachers’ impressions of the technology and offering only limited research-based evidence attesting to the real educational benefits. Now that the initial novelty of virtual worlds has worn off and the hype surrounding them has
begun to subside, educators are faced with an imperative to look beyond the
rhetoric for proof about what actually works and what does not. As the tech-
nology gradually approaches maturity (see LeHong & Fenn, 2012; Gartner,
2012), virtual world proponents are being forced to confront the reality of rising
hosting and maintenance costs, and must build stronger, more defensible busi-
ness cases grounded in research to justify continued investment within their
institutions and organizations.

This book has been created with the mission of advancing scholarly inquiry
and developing and sharing best practices in the use of virtual worlds for learn-
ing in formal, non-formal, and informal education settings. Its objectives are
threefold. First, the chapters supply readers new to the field with an introduc-
tion to the current knowledge base in the domain of virtual worlds for learning.
Second, they present leading-edge research that will be of interest to experts
and novices alike. Third, the editors hope that the coverage of emerging trends
and developments will identify areas in need of further investigation, including
opportunities for future theoretical and empirical research.

Overall, the editors and contributors seek to provide a forum for research-
informed, evidence-based perspectives on the educational uses of virtual worlds.
It is intended to serve as a one-stop resource that is relevant and useful to a wide
audience including teachers, students, and researchers, as well as administrators
and policy-makers.

How the Book is Organized

This book consists of three sections, each comprising a number of chapters
that consider current research topics and challenges relating to learning in vir-
tual worlds. Each one of the thirteen chapters deal with an aspect of the inter-
actions between the learner and the virtual world, technological innovations
that hold particular promise for the enhancement of the virtual world learner
experience, or the design and implementation of virtual world-based learn-
ing interventions. What follows is a brief descriptive overview of the sections
and chapters. At the end of the book is an Epilogue where we review the key
findings from the chapters, identifying and discussing prominent issues and
themes that emerge. We also contemplate possible future research directions.

Section 1: Human–Computer Interaction

The first section of this book is devoted to examination of some of the human
factors pertaining to learning in virtual worlds. In the opening chapter,
“Navigation and Wayfinding in Learning Spaces in 3D Virtual Worlds,” Shailey
Minocha and Christopher Hardy report on research carried out at The Open University in the UK aimed at achieving a better understanding of how users navigate and find their way around learning spaces in Second Life, and what can be done to improve the usability of spaces. This research is important because navigation and wayfinding can have a profound influence on the effectiveness and efficiency of learning activities undertaken in avatar-based 3D virtual environments. Through student-user observation, interviews, and heuristic evaluations conducted using predefined criteria, the authors were able to derive a set of evidence-based guidelines for the design of virtual world-based learning spaces and tasks. Minocha and Hardy proffer those guidelines to help designers and educators minimize learners’ frustration and confusion and discourage time-wasting activities that distract them from core tasks and objectives.

The second chapter, “Communication Modality, Learning, and Second Life” by Stephany Wilkes explores a key issue for educators considering the use of virtual worlds for learning and teaching: that of communication modality. Specifically, Wilkes is concerned with the question of whether text communication, voice communication, or a combination of both should be used. Wilkes employed a quantitative study that looked at the impact of communication modality on cognitive load, short-term retention, and perception of presence in an inworld course on building in Second Life completed by 60 students. She found that the choice of communication modality had an effect on cognitive load and retention levels, but not on the perceived sense of presence. Wilkes discusses the implications and recommendations for practitioners in light of the findings, and cautions readers against making assumptions about the appropriateness or superiority of one communication modality over another in the absence of information about learners’ backgrounds and prior experience, or without taking into account the context and nature of the learning tasks.

Chapter 3 by Laura Fedeli, “Virtual Body: Implications for Identity, Interaction, and Didactics,” is about embodiment in a virtual world—in particular, how the ability to assume an avatar and carry out actions and interactions with it can give rise to active, social, and experiential learning not possible through the use of other technologies and media forms. While it is known that virtual worlds have a number of unique distinguishing characteristics that lend themselves to learning and teaching applications, including the facilitation of embodied actions and verbal and non-verbal communication, empirical evidence connecting these characteristics to the learner’s construction of an inworld identity and his or her experience of a sense of presence and co-presence within the virtual world is sparse (see also Mikropoulos & Bellou, 2006; Mikropoulos & Natsis,
Similarly, while a number of virtual world learning affordances have been identified by various authors (see, for example, Dalgarno & Lee, 2010; Hollins & Robbins, 2008; Warburton, 2009), there is a paucity of knowledge about the precise relationships that exist between the aforementioned characteristics of a virtual world and the pedagogical benefits arising from the performance of learning tasks that the technology affords. Fedeli’s chapter addresses these gaps in the literature by reporting on a study that involved 21 educators as research participants and focused on their use of Second Life in their teaching practice. The researchers analyzed open-ended questionnaire responses and transcripts of inworld interviews and focus group sessions to obtain deep insight into the participants’ experiences.

The next two chapters have a strong social justice theme in that they are concerned with promoting equity for particular groups of learners—namely, learners with disabilities or elderly learners—and ensuring these groups are able to successfully partake in virtual world-based learning activities. The first of these, Chapter 4, “(In)Accessible Learning in Virtual Worlds” by Robert Todd, Jessica Pater, and Paul Baker, tackles the problem of accessibility as it applies to educational applications of virtual worlds. It highlights critical issues that act as barriers keeping disabled learners from participating and makes recommendations for mitigating those issues that include both technical solutions (i.e., involving the use of assistive technologies) as well as those that relate to the way in which the environment, resources, and learning tasks are designed and implemented. The authors concentrate on Second Life and OpenSim, with a detailed treatment of the accessibility-related challenges and affordances of the former.

In Chapter 5, “Benefits of Second Life in the Ageing Population,” Ann Smith describes pilot studies examining the use of virtual worlds for learning by older people. This work points to the numerous potential benefits that stand to accrue from senior citizens’ participation in virtual worlds, which include a range of social, psychological/emotional, and developmental benefits. At the same time, however, Smith also calls attention to the need for careful consideration of various aspects of interface and task design as well as the need to provide dedicated training and support for these learners. Smith examines usability and other problems that may be encountered by elderly users in a virtual world, as observed in the pilot studies, and she offers some suggestions for practice, further research, and development.

The first section concludes with a position piece by Helen Farley: Chapter 6, “The Reality of Authentic Learning in Virtual Worlds,” which questions common assumptions held and claims made with regard to the capacity of virtual worlds
for enabling so-called authentic learning. Farley contends that although virtual worlds may seem, at face value, to be the ideal environment to have students engage in learning that prepares them for the tasks, problems, and challenges they will face in the real world—arguably a primary goal of all formal education in the twenty-first century—certain subject areas and knowledge domains do not lend themselves to simulated learning in virtual worlds, at least in their current form. Farley examines some of the factors influencing the success of attempts to facilitate authentic learning in virtual worlds and some of the limitations of technology currently available in the mainstream.

**Section 2: Advanced Technology**

Many of the basic, underlying technologies seen in virtual worlds are not new but have existed for some time, and have been used in education in some form for well over two decades (Mikropoulos & Natsis, 2011). That said, at the turn of the millennium there was a sort of renaissance, a renewal of interest and activity in the area of desktop and networked virtual reality environments. A new generation of massively multi-user virtual world platforms was born with the mainstreaming of high-speed, broadband Internet connectivity, which is now commonly available in homes and workplaces in addition to schools, colleges, and universities. These platforms are highly extensible, lending themselves to tailoring and modification even by novice users who have no knowledge of programming. More technically savvy users can create powerful scripts that allow the virtual environment and objects within it to exhibit sophisticated custom behaviours, relying on simple rule-based systems or complex artificial intelligence techniques.

The second section of the book comprises two chapters focusing on advanced technologies that can be embedded into virtual worlds to support and augment the learner experience, with an emphasis on the possibilities offered by software-based agents in the form of “bots,” or non-player characters (NPCs). The section begins with Chapter 7, “Conversational Agents in Second Life: Freudbot” by Robert Heller, Mike Procter, and Corbin Rose, which looks at the potential of conversational agents, in particular those representing historical figures, used inworld in an online and distance education context. The case study they report on focuses on the use of Freudbot, an agent based, as its name suggests, on the nineteenth-century psychologist Sigmund Freud. The study analyzed transcripts from 39 conversations between learners and the Freudbot agent within Second Life along with transcripts from 25 conversations between learners and a similar text-based agent outside of a virtual world in order to
compare the levels of social presence and learner engagement evident in each. There were no significant differences in measures of social presence and engagement, although variations were discovered in the characteristics of the conversations. The authors make some preliminary observations regarding conversational agents in virtual worlds that may help guide and inform subsequent work in the area.

Chapter 8, “Virtual Bots, Their Influence on Virtual Worlds, and How They Can Increase Interactivity and Immersion through VirtualPREX” by Torsten Reiners, Sue Gregory, and Vicki Knox, provides a different perspective on bots, describing their use as part of a project called VirtualPREX (Virtual PROfessional EXperience), aimed at enabling pre-service teachers to practise their lesson delivery and classroom management skills in a virtual world environment to prepare for their school-based professional experience placements (more information about the VirtualPREX project can be found in Masters, Gregory, Dalgarno, Reiners, & Knox, 2015). They focus on how these bots can be used in place of human-controlled avatars to increase interactivity and immersion for learners in a virtual world, the rationale being that it is often not feasible to have real actors role-playing characters, especially in scenarios involving large numbers of “people.” The authors introduce four platforms and script libraries that can be used to develop bots in Second Life—Pikkubots, Pandorabots, Logic System, and LIBOPENMV—before explaining how bots were designed and scripted to act as virtual children (primary school students) in the VirtualPREX simulated classroom environment.

Section 3: Learning Design and Implementation

In the third and final section of the book, the authors turn their attention to topics that have to do with the design of virtual world-based learning tasks and interventions, and with the implementation of those designs in various educational settings. In Chapter 9, “Analyzing Teaching Practices in Second Life: A Design Taxonomy for the Implementation of Workshops in Virtual Worlds,” Steven Warburton and Margarita Pérez García propose a taxonomy suitable for the design of hands-on workshops to be conducted in a virtual world, drawing on studies of 177 such workshops. Warburton and Pérez García examined the workshops using an “analysis grid” that yielded a set of 27 descriptors, grouped under the four headings of “planning and preparation of the instruction,” “delivery of the instruction,” “follow up and evaluation,” and “activities for recalling and transferring learning.” The grid was then repurposed as a design scaffold and they evaluated its use in this way in a further 52 inworld workshops.
Next, in Chapter 10, “NetConnect Virtual Worlds: Results of a Learning Experience,” Francesca Bertacchini and Assunta Tavernise report on the design and use of three virtual world environments devoted to cultural heritage learning. Students between the ages of 15 and 18 were able to “visit” and explore virtual archaeological sites in the form of inworld reconstructions of historical settlements in Poland, Germany, and Italy that have been ruined or no longer exist. This case study demonstrates a clear need for groups to come together when using pedagogical approaches that draw upon student contributions, and for development and research that goes beyond simulation and the mere provision of information. The co-construction of knowledge among the groups is an important outcome, and opens the door for moving toward deep learning for individuals in collaboration with their peers.

Chris Campbell and Leanne Cameron wrote Chapter 11, titled “Scaffolding Learning Through the Use of Virtual Worlds,” which relays the findings of two projects: the first involving fourth-year undergraduate student teachers learning with and about Second Life, and the second involving secondary school students using OpenSim for what they described as “construction activities.” Support provided to students consisted of familiarization exercises they took prior to commencing the main part of the activity, just-in-time support delivered within the face-to-face classroom during the course of the activity, and technology-mediated support, also during the activity, through various Web 2.0 tools as well as supplementary image and video resources. Campbell and Cameron evaluated the activities, and in particular the scaffolding methods and approaches employed through questionnaires, focus group interviews, and student reflective journals.

Chapter 12 by Paul Resta and Miri Shonfeld, “Challenges and Strategies in Designing Cross-national Learning: Team Projects in Virtual Worlds,” is an account of a series of studies in which graduate education students from Israel and the United States worked in teams consisting of a mix of students from each country. The teams were tasked with developing virtual world-based learning activities such as Virtual WorldQuests (similar to WebQuests, but undertaken inworld), field trips, and role plays using a combination of asynchronous and synchronous communication mechanisms to discuss their ideas and produce and share project deliverables that were subjected to both instructor and peer assessment. The researchers conducted surveys and interviews with student participants to identify the perceived strengths and weaknesses of the approach, particularly in terms of social presence, group cohesion, engagement, and satisfaction, and to develop advice for other educators wishing to organize similar
cross-national, cross-cultural project-based learning experiences for their students that capitalize on the collaborative capabilities of virtual worlds.

Lastly, the closing chapter in the book, Chapter 13, “Introduction to Laws Relevant to Virtual Worlds in Higher Education,” is a contribution by Layla Tabatabaie, who provides an analysis of the key legal considerations in the use of virtual worlds in higher education. She surveys the legal and public policy landscape of this area and makes comparisons between countries that are representative of each of the three major legal systems of the world: the American system (represented by the US), the English system (represented by England), and the Far East system (represented by China). University and college teachers, students, and administrators from across the globe will find this international comparative analysis invaluable as it provides practical insight and guidance for navigating the pitfalls within their relevant jurisdictions.

This anthology provides the reader with an overview of how virtual worlds can and are being used for online, face-to-face, and blended learning, focusing on three sections: technology, usability, and design. An international lineup of authors provide chapters outlining research that readers can consider when using virtual worlds in their own teaching and scholarship.

REFERENCES


